

# Materials Science Laboratory

The Materials Science Laboratory (MSL) is an interdisciplinary facility dedicated to research on current materials and those of future interest. It is a 56,000 square-foot modern facility that can be easily reconfigured to accommodate new processes and operations. It comprises 27 laboratories, 15 support rooms, and 60 offices. The MSL supports many distinct materials research topics, grouped into four focus areas: mechanical behavior, materials processing, synthesis, and characterization. Research within the MSL supports programs of national interest in defense, energy, and the basic sciences.

The MSL is a non-classified area in the Materials Science Complex in close proximity to classified and other non-classified materials research facilities. The Materials Science Complex accommodates most of the materials scientists at Los Alamos. The MSL is equipped with state-of-the-art research tools and is arranged to encourage a sense of community among Los Alamos staff and collaborators from industry and academia. The MSL provides the latest in controls and safeguards for protection of the public, the environment, and the people working in and around the facility.



## Fast facts

The Materials Science Laboratory features state-of-the-art materials research capabilities, including:

- Advanced materials synthesis
- Corrosion compatibility
- Dynamic testing
- Electron microscopy
- High-temperature superconductivity
- Laser processing
- Materials and process modeling
- Mechanical testing
- Micromechanics and nanoindentation
- Microwave processing
- Optical metallography
- Organometallic chemistry
- Polymer characterization
- Pulsed laser deposition/CVD
- Single crystal synthesis
- Spectroscopy – including Raman and FTIR
- Surface science
- X-ray diffraction



## Contact

**Paul S. Follansbee**  
 Materials Science Laboratory  
 Mail Stop G754  
 Los Alamos National Laboratory  
 Los Alamos, NM 87545  
 Tel: 505-665-1131  
 Fax: 505-665-2992  
 e-mail: [pfolansbee@lanl.gov](mailto:pfolansbee@lanl.gov)

# Materials Science Laboratory areas of research

## Mechanical behavior in extreme environments

Our pre-eminence in structural materials and their mechanical behavior is highlighted by a suite of capabilities consolidated within the MSL. Several laboratories contain equipment for subjecting materials to a broad range of mechanical loadings to study their fundamental properties and characterize their performance. The mechanical testing laboratory offers uniaxial as well as multiaxial loading capability at a wide range of temperatures and strain rates.

## Materials processing

Within the MSL, specialized equipment for novel mechanical processing of powders and non-dense materials is configured to explore net shape and zero-waste manufacturing processes. Several laboratories are dedicated to the development of chemical processing technologies, including recycling and reprocessing techniques that are more environmentally acceptable.

## Advanced materials development

Exploring new materials for high-strength and unique (e.g., radiation resistant) applications is one of the strengths of the materials research program at Los Alamos. Many of the MSL laboratories support synthesis and characterization of single crystals, nanophase, amorphous materials, and layered materials systems for high-temperature superconducting applications.

## Materials characterization

Characterization enhances our ability to understand properties and processing and to apply that understanding to materials development. Within the MSL resides a collection of spectroscopy, imaging, and analysis tools. The electron microscopy laboratory has four microscopes to characterize sub-nanometer to micrometer structures, including chemical analysis and high-resolution electron holography. Other laboratories are configured for spectrographic analysis based on a range of techniques. The optical spectroscopy laboratory, built around tunable titanium-doped sapphire lasers, allows ultrafast and continuous wave tunable resonance Raman scattering spectroscopy, high-resolution FTIR absorption, and UV-visible-near IR absorption spectroscopy. The x-ray laboratory contains a 16 kW rotating anode generator coupled with a high temperature theta-theta diffractometer and a Peltier-cooled solid state detector. Samples can be studied at temperatures up to 2700°C and pressures up to 80 kbar. A metallography/ceramography support laboratory is equipped with the latest equipment for optical characterization.

